

UC San Diego

SKAGGS SCHOOL OF PHARMACY
AND PHARMACEUTICAL SCIENCES



STRATEGIC PLAN

(2017 – 2022)

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MESSAGE FROM THE DEAN

We are particularly proud of the accomplishments made at the Skaggs School of Pharmacy and Pharmaceutical Sciences over the past five years. Our Strategic Plan for the next five years outlines in detail our goals for advancing education, clinical practice, and research at our School. We expect these goals to have a true focus that will guide how we use existing and future resources to meet our commitments. My sincere thanks to everyone at the School who contributed to this effort.

Sincerely,

James McKerrow, Ph.D., M.D.

Dean, Skaggs School of Pharmacy & Pharmaceutical Sciences

UC San Diego

STRATEGIC PLAN OVERVIEW, MISSION, VISION AND VALUES

Overview

The 2017-2022 strategic plan for the Skaggs School of Pharmacy and Pharmaceutical Sciences (SSPPS) emanates from the work of faculty in three divisions and the leadership core (Division Chairs, Co-Chairs of the Committee on Educational Policy, Associate Deans, and the Dean). The strategic plan was reviewed by the faculty, staff, and student leaders. The plan describes overarching goals and objectives in schoolwide initiatives, education, clinical practice, and research that will enable SSPPS to fulfill its mission.

Mission

The mission of SSPPS is to educate future pharmacists and scientists to become leaders in diverse fields, transform pharmacy and pharmaceutical sciences, and improve human health.

Vision

The vision of SSPPS is to be a catalyst for creative approaches and excellence in pharmacy and pharmaceutical sciences education, discovery, and service from local to global communities.

Values

We will uphold the same values shared on the campus of UC San Diego. We will achieve our mission by being distinctive and by using our comparative advantage. The values that define UC San Diego create an environment and a culture where:

- Excellence in teaching, research, patient care, and a people- and service-oriented culture that supports learning, scholarly work, and public service are the norm
- Collaborative and interdisciplinary activities lead to discoveries, technologies, cures, scholarship, and creative works that advance and enrich society
- Diversity, equity, and inclusion enable academics, students, and staff to excel and provide opportunity for all to succeed
- An entrepreneurial spirit leads to agility, taking risks, and creating innovative approaches to solving problems is encouraged
- Public engagement, sustainability, integrity, and ethics are core principles guiding our activities

BACKGROUND

Since opening in 2002, SSPPS has risen rapidly to the top ranks of the 140 accredited pharmacy schools in the United States. SSPPS has achieved distinction because of the success of its students and graduates, the high caliber of faculty research and clinical programs, and its collaborative leadership in the community. SSPPS currently has 54 full-time salaried faculty members, 3 divisions, a student body of 248 PharmD students, and 30 affiliated pharmacy residents in training. Between the years 2002 and 2017, SSPPS has matriculated approximately 870 students into the PharmD degree program. Pharmacy students share curricula with UC San Diego medical students, a novel interdisciplinary model that enriches the student experience and prepares both PharmD and MD practitioners to work together as members of the patient care team. At this time approximately 50% of SSPPS PharmD graduates pursue advanced specialty training through residencies; 99% of first time takers pass the national licensure board exam.

Clinical pharmacy faculty in SSPPS play leadership roles in a variety of novel programs at the local, regional, state, national, and international levels that are designed to improve outcomes and decrease costs and adverse events associated with medication therapy. Through close collaboration with other healthcare professionals, SSPPS faculty lead health-systems and community pharmacy practices to enhance care of patients with chronic diseases and acute conditions. Faculty are also developing a variety of innovative approaches to expand and improve pharmacist-provided patient care.

Through internationally recognized programs in a variety of areas of basic and clinical research, SSPPS ranks 6th among pharmacy schools in total federal grants, with total grant funding in 2015-2016 exceeding \$14 million. The rapid rise to preeminence of SSPPS as a major academic and research center has been fueled by interdisciplinary interactions with other units throughout the UC San Diego campus, in the surrounding research and biotechnology community, and elsewhere nationally and internationally.

To achieve the mission, SSPPS has developed a strategic plan that encompasses schoolwide initiatives, education and training, clinical pharmacy division, and pharmaceutical chemistry and pharmaceutical sciences divisions. The following provides a high level summary, followed by details of the strategic plans for these areas.

EXECUTIVE SUMMARY

Schoolwide Initiatives. Four schoolwide initiatives will involve faculty efforts from all three divisions. These forward-thinking programs include (1) graduate programs – develop new masters programs related to drug development and product management, informatics, and pharmacogenomics; and transform current PharmD/PhD program into the first NIH training grant supported program; (2) informatics and data science for big data – build programs to integrate data and processes from drug discovery through clinical practice, using artificial intelligence and intelligence amplification tools to achieve precision in diagnosis and optimal drug therapy; (3) pharmacogenomics – develop educational program, clinical service opportunities, and research involving interdisciplinary teams; and (4) optimize drug therapy response – conduct investigations to optimize drug therapy and improve patient-centered care.

Education and Training. SSPPS has an overarching vision to educate and train doctors of pharmacy to become leaders of the profession who will bring about innovative changes in the discovery, delivery, and use of safe and effective medicines. To deliver this forward thinking education, SSPPS will: (1) develop clinical and basic science training programs that advance the fields of pharmacy and pharmaceutical science; (2) provide and innovate inter-professional learning and teaching; (3) uphold an educational environment that fosters the promotion of well-being and encourages well-rounded, holistic students with a strong sense of community; and (4) become a leader in national and international training and education. We vigorously train doctors of pharmacy with a strong scientific foundation in biomedical education combined with advanced clinical pharmacy practice. The ultimate educational mission of SSPPS is to provide an exceptional training experience that positions graduates at the forefront of the fields of pharmacy and pharmaceutical sciences, and embraces effective new models and methods for teaching. Through advanced joint programs that bridge pharmacy practice with both basic and applied research, the school promotes interdisciplinary education and collaboration among pharmacy, medicine, biomedical research and public health disciplines.

Clinical Division. The vision of SSPPS clinical pharmacy is to deliver excellence in clinical pharmacy with emphasis on collaborative care and innovative practice models. To reach this vision, the faculty, staff and leadership are committed to the following four goals: (1) advance innovative care models to optimize health; (2) cultivate and expand collaborations with partners to improve overall community health; (3) achieve excellence in pharmacy related research that improves health; and (4) foster, strengthen, and sustain visionary faculty practitioners. Through close collaboration with other healthcare professionals within UC San Diego, SSPPS faculty lead hospitals and clinics that enhance care of patients with acute, chronic, and long-term conditions. Faculty are developing many approaches—using information technology, creating novel continuing education programs, and implementing

technology for medication monitoring—to expand and improve pharmacist-provided patient care. Health services and outcomes research evaluations are pursued to disseminate results of innovative clinical practice and educational models to advance pharmacy practice and education.

Pharmaceutical Chemistry and Pharmaceutical Sciences Divisions. In the areas of pharmaceutical chemistry and pharmaceutical sciences, our vision is to establish SSPPS as the pharmaceutical sciences hub of drug discovery research. To achieve this goal, the faculty, staff and leadership are committed to the following five goals: (1) develop enabling drug discovery strategies and novel pharmaceuticals to solve unmet therapeutic needs; (2) develop innovative technologies for pharmaceutical sciences research; (3) build a school-wide program for pharmaceutical data sciences integrating data and processes from discovery through practice (and back); (4) train the next generation thinkers and innovators in pharmaceutical sciences; and (5) establish SSPPS as a hub of drug discovery excellence. Research faculty collaborates with other researchers across campus, between other academic institutions on the Mesa and with the biotech industry to form partnerships that address challenging health problems, including acute, chronic, infectious and neglected tropical diseases, as well as health related effects from pollution and climate change.

These strategic plans are aligned with the overall vision of the UC San Diego strategic plan in being a student-centered, research-focused and service-oriented organization.

SCHOOLWIDE INITIATIVES

Schoolwide initiatives are big, forward-thinking programs that will impact both clinical and basic science faculty, and broadly involve education, research, clinical service, and outreach. These are initiatives that divisions will work on together.

Initiative 1: Graduate programs

We will assess and develop master's degree programs related to drug development and product management, informatics, and pharmacogenomics. We will transform our current PharmD/PhD program into the first NIH training grant supported PharmD/PhD program. Scientific pathways would focus on areas in which students could leverage dual degrees to advance translational research. Areas could include pharmacogenomics, marine natural science, pharmaceutical outcomes, and pharmacoeconomics.

Initiative 2: Informatics and Data Science for Big Data

We will build school-wide programs using informatics and data science tools to integrate data and processes from drug discovery through clinical practice. Big data sourced from clinical data (e.g., health records, drug claims), personal data (e.g., wearable devices), public health data (e.g., post-marketing surveillance, immunization records), and molecular data (e.g., multi-omics, biobanks) can be further processed using artificial intelligence (using machine learning and algorithms to improve processes) and intelligence amplification (amplifying human intelligence by making data more understandable and actionable) to achieve precision in diagnosis and optimal drug therapy.

Initiative 3: Pharmacogenomics

Pharmacogenomics testing may improve our ability to predict an individual's response to therapy or the development of adverse reactions. Improvements in technology have enabled the use of genome-wide association studies in place of the candidate gene approach to associate specific genetic variants or quantitative differences in gene expression with drug response. Despite the growing body of research in pharmacogenomics, the clinical utility remains to be explored and must be validated. UC San Diego is poised to contribute to this field from discovery to clinical implementation and education. We aim to further develop educational program(s), service opportunities and research involving interdisciplinary teams.

Initiative 4: Optimize Drug Therapy Response

We will conduct investigations to optimize drug therapy and improve patient-centered care by employing advanced methodologies uniquely available at SSPPS. We strive to improve our understanding of the variability in individual patient drug response by utilizing a multi-pronged approach that includes areas such as proteomics, metabolomics, pharmacokinetic modeling, and bioinformatics. We plan to cultivate awareness of our complementary faculty expertise across our three divisions and in the greater UC San Diego community, with the ultimate goal of increasing the number and impact of inter-division collaborative projects.

STRATEGIC PLANS FOR EDUCATION AND TRAINING

The mission of SSPPS is to educate and train doctors of pharmacy, graduate students, and post-doctoral scholars to become leaders of their respective professions. SSPPS trains students through strong scientific foundations in biomedical education, pharmaceutical sciences and clinical sciences. Our ultimate goal is to provide an educational experience that embraces new models and methods for teaching, and encourages a scholarly attitude to inspire students for a future of life-long learning, innovation and entrepreneurship. We will prepare leaders who will bring about innovative changes in the discovery, development, and delivery, and use of safe and effective medicines.

Goal 1. Continuously develop clinical and basic science training programs that advance the fields of pharmacy and pharmaceutical science

- a) Provide a dynamic PharmD curriculum that establishes a foundation for students to pursue a career in advanced pharmacy practices
- b) Develop additional degree programs to expand pharmaceutical knowledge within the University and in the community
- c) Provide innovative post-doctoral training to position graduates at the forefront of the fields of pharmacy and pharmaceutical sciences
- d) Develop and evaluate novel teaching methodologies that are at the leading edge of pharmacy and pharmaceutical sciences education

Goal 2. Provide and innovate inter-professional learning and teaching in the basic and clinical sciences based on the founding principles of SSPPS

- a) Strengthen the collaborative curriculum within the UC San Diego Health Sciences
- b) Provide a collaborative education with other health professions
- c) Develop collaborative educational opportunities with other disciplines such as the life and physical sciences, engineering, law, and business

Goal 3. Uphold an educational environment that fosters the promotion of well-being and encourages well-rounded, holistic students with a strong sense of community

- a) Support student well-being through extracurricular professional engagement
- b) Produce diverse and engaging co-curriculum opportunities
- c) Create novel teaching methodologies that encourage active learning, small group discussions and laboratories, and team based learning
- d) Foster strong faculty-student engagement

Goal 4. Become a leader in national and international training and education, a widely recognized strength of UC San Diego

- a) Expand our experiential, graduate and post-graduate programs nationally and internationally
- b) Create a 10-year educational plan with new international biomedical affiliations
- c) Continue to develop global exchange programs with Schools of Pharmacy, Pharmaceutical Sciences and other health science professionals in Asia, Europe, Africa, the Middle East and Central and South America

STRATEGIC PLANS FOR CLINICAL DIVISION

The vision of SSPPS clinical pharmacy is to deliver excellence in clinical pharmacy with emphasis on collaborative care and innovative practice models. To reach this vision, the faculty, staff and leadership of SSPPS are committed to the following goals:

Goal 1. Advance innovative care models to optimize health

- a) Create and implement innovative pharmacy practice models
 - 1. Create new practice models within and outside of UC San Diego that improve patient outcomes
 - 2. Form partnerships within and outside of UC San Diego to expand the number of patients and providers benefiting from pharmacist services
 - 3. Involve trainees in the development and implementation of advanced pharmacy practice models¹

- b) Evaluate and improve patient-related outcomes of pharmacy practice models
 - 1. Develop performance measurement systems to highlight the impact on patient care
 - 2. Perform continuous quality improvement initiatives
 - 3. Explore and expand methods for collective evaluation of clinical services
 - 4. Evaluate financial sustainability and value

- c) Disseminate outcomes of pharmacist practice models
 - 1. Share outcomes with care teams and clinical faculty for continuous quality improvement
 - 2. Present and publish individual and collective methods and outcomes within health systems, with UC Consortium partners in California, nationally, and internationally
 - 3. Involve trainees in dissemination

Goal 2. Cultivate and expand collaborations with partners (local, state, national and global) to improve community health

- a) Educate patients, caregivers, healthcare professionals, and communities about health issues and medication use

¹ Advanced pharmacist practice models are interpreted as representing a broad array of innovative clinical pharmacy initiatives, not limited to pharmacists with licensed APP status

- b) Collaborate with community partners to implement health and medication use programs
- c) Mentor and empower trainees for lifelong engagement with their communities

Goal 3. Achieve excellence in pharmacy related research that improves health

- a) Evaluate novel pharmacy practice models and interventions
- b) Investigate drug disposition and optimal medication use
- c) Conduct population-based studies of medication and health service utilization
- d) Evaluate contemporary training programs and teaching methods

Goal 4. Foster, strengthen, and sustain visionary faculty practitioners

- a) Recruit and retain exceptional faculty to create and maintain innovative practices
- b) Promote opportunities that expand leadership and professional development of faculty at the local, state, national and international levels
- c) Expand and enhance interprofessional collaborations

STRATEGIC PLANS FOR PHARMACEUTICAL CHEMISTRY AND PHARMACEUTICAL SCIENCES DIVISIONS

The vision of the pharmaceutical chemistry and pharmaceutical sciences divisions is to establish SSPPS as the pharmaceutical sciences hub of drug discovery research in Southern California. In doing so we will solve critical human health problems through pioneering scientific research and by training the next generation of pharmaceutical sciences innovators.

To achieve this goal, the Pharmaceutical Sciences (PS) and Pharmaceutical Chemistry (PC) divisions within SSPPS will continue to build a robust drug discovery pipeline that contains all of the essential elements and research expertise needed to bring a drug from discovery to clinical trials. This pipeline includes the identification of novel targets, discovery and synthesis of chemical entities from natural products and medicinal chemistry efforts, phenotypic and target specific screening, pharmacokinetic and pharmacodynamic analyses, modern drug delivery strategies and in vivo animal models. In support of such drug discovery, the PS/PC Divisions will continue to build and strengthen its university-wide leadership in enabling technologies such as mass spectrometry, nuclear magnetic resonance, natural products chemistry and chemical biology, high-throughput/high-content screening, computational drug design and big data analysis. Through the development of highly interdisciplinary initiatives, this pipeline and enabling technologies are engaging researchers across campus, between other academic institutions on the Mesa and with the biotech industry to form new partnerships that address challenging health problems in fundamentally new ways. In addition to tackling traditional health care challenges in e.g. cancer, neurodegenerative and inflammatory diseases, new efforts directed towards neglected tropical diseases, the emerging epidemic in antibiotic resistance, and health related effects from pollution and climate change are being deployed. All of these endeavors not only integrate the diverse research expertise of scientists on campus and the Mesa, but bring about educational opportunities for training at all levels, and for outreach and engagement of the community. The following strategic areas will achieve this vision:

Goal 1. Develop enabling drug discovery strategies and novel pharmaceuticals to solve unmet therapeutic needs

- a) Discover and develop new chemical entities from natural and synthetic sources as drug leads for diverse human diseases
- b) Establish a biologics and/or antibody-drug conjugate discovery program
- c) Identify and characterize novel therapeutic targets through the application of genomic and phenotypic screens and targeted assays
- d) Utilize and develop innovative structural and computational approaches to optimize the efficacy of drug leads against therapeutic targets

- e) Integrate comprehensive pharmacokinetic, pharmacodynamic, toxicity and metabolic profiling into the optimization of drug leads
- f) Develop novel drug delivery strategies that minimize toxicity and maximize specificity
- g) Capitalize on the expertise of the Pharmaceutical Chemistry/Pharmaceutical Sciences faculty to drive campus-wide initiatives (Center for Microbiome Innovation, Collaborative to Halt Antibiotic Resistant Microbes (CHARM), Human Health and the Oceans Initiative (H2O))

Goal 2. Develop innovative technologies for pharmaceutical sciences research

- a) Advance mass spectrometry technologies for proteomics, peptidomics, metabolomics, biomarkers and chemical structure determination
- b) Promote the development of new methodologies in NMR spectroscopy, including enhanced data accumulation approaches and application of deep convolutional neural networks to NMR pattern recognition
- c) Integrate state-of-the-art analytical instrumentation and facilities (NMR, X-ray crystallography and mass spectrometry) into the drug discovery process
- d) Develop a privileged compound library of synthetic and natural products to accelerate the discovery of next generation therapeutics
- e) Advance the state of the art in computer-aided therapeutic design
- f) Fully engage SSPPS drug development pipeline as the campus-wide technology engine for therapeutic discovery

Goal 3. Build a school-wide program for pharmaceutical data sciences integrating data and processes from discovery through practice (and back)

- a) Synergize SSPPS discovery platforms by integrating molecular data sources, including mass spectrometry, NMR, and chemical and structural databases, and expanding their capabilities by linking with computing resources to further enable basic science discovery and collaboration
- b) Expand SSPPS data discovery capabilities by building on and contributing to UC San Diego and community initiatives for:
 - 1. Discovery; for example, linking core facilities to connect potential collaborators based on automated data correlations or connecting computational resources to augment biological information derived from primary data (e.g., linking mass spectrometry data to Protein Data Bank)
 - 2. Clinical outcomes; for example, expanding discovery platforms to facilitate analysis of SSPPS pharmacy practice cohorts or integrating with UC San Diego precision medicine initiatives linking patient records with therapeutic outcomes

- c) Build capability to use clinical informatics systems and new data sources, such as smartphones and web-search statistics, to inform clinical decision making and to stimulate basic and clinical research
- d) Discover new ways of applying machine learning (ML) and artificial intelligence (AI) to pharmaceutical sciences research and clinical practice
- e) Empower human-centric (different from data-centric or computer-centric) discovery with Intelligence Augmentation (IA) approaches integrating advanced visualization techniques with seamless automated application of AI/ML algorithms to facilitate large-scale data exploration and intuitive discovery
- f) Develop a pharmacogenomics program for personalized medicine

Goal 4. Train the next generation thinkers and innovators in pharmaceutical sciences

- a) Launch the “Pharmaceutical Sciences and Drug Development” training area of the Biomedical Sciences Graduate Program to educate and train PhD students
- b) Expand the PharmD/PhD program and spearhead NIH support for the dual degree
- c) Support the establishment of the Master of Science in Drug Development and Product Management
- d) Establish creative approaches to enhance the interdisciplinary training of graduate students and postdoctoral fellows through joint mentorship, industrial internships and other experiential opportunities
- e) Expose pre-college students to pharmaceutical sciences research through programs such as California Shaman and high school student summer internships
- f) Engage and educate the local community to the importance and impact of SSPPS discoveries and initiatives
- g) Develop Center grants that unite research efforts of SSPPS faculty with faculty on the UC San Diego Campus and La Jolla mesa, and align with the UC San Diego Health Sciences Strategic Plan
- h) Contribute to the global community of pharmaceutical scientists through international collaborations, outreach and scholarly interactions

Goal 5. Establish SSPPS as a hub of drug discovery excellence

- a) Develop a business model for community access to SSPPS drug discovery infrastructure (drug discovery pipeline, compound library, core facilities, analytic services and related expertise)
- b) Establish partnerships with local pharmaceutical companies for opportunities in funding, training, resources and collaborative research